

Using Health IT:

Eight Quality Improvement Stories



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Health IT



Using Health IT: Eight Quality Improvement Stories

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Prepared by: Mathematica Policy Research

Authors:

Melanie Au, M.P.P., Researcher
Suzanne Felt-Lisk, M.P.A., Senior Health Researcher
Grace Anglin, M.P.H., Research Analyst
Andrew Clarkwest, Ph.D., Researcher

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Executive Summary

Policymakers as well as private-sector coalitions and individual health care leaders are heavily engaged in planning future health information technology (health IT). This report aims to bring to these deliberations the experience and examples of eight pioneering projects completed under AHRQ's Transforming Healthcare Quality through Information Technology (THQIT) program.

Introduction

In 2004 and 2005, AHRQ funded 118 grants and cooperative agreements under the THQIT program to support health IT implementation. Three types of grants were awarded:

- Planning grants of up to \$200,000 for up to 1 year in 2004, to assist health care organizations considering health IT adoption to develop their infrastructure and data-sharing capacity.¹ The awards required partnerships composed of at least three organizations.
- Implementation grants in two waves to support development of community-wide and regional health IT systems. As with the planning grants, partnerships consisted of at least three organizations. The first wave was awarded in 2004 under a general request for applications (RFA-HS-04-011) and the second wave in 2005 to selected applicants who had successfully completed a planning grant (RFA-HS-05-013). Both waves had to contribute in-kind funding to their projects. The total budgets for these grants were often \$3 million or more, with up to 50 percent to a maximum of \$1.5 million funded by AHRQ. Although AHRQ expected the original time period to be 3 years, in many cases the Agency granted no-cost extensions. All grant projects concluded during 2007-2010.
- Value grants, awarded in 2004, were designed to advance understanding of the value of health IT for care quality, safety, efficiency, and patient-centered care. They were more traditional research grants, with partnerships (RFA HS-04-012). AHRQ provided up to \$1.5 million in total for up to three years. Like the implementation grants, some projects were extended, but all ended by early 2010.

To leverage the impact of Federal funds on the THQIT program, AHRQ contracted with Mathematica Policy Research (based on a competitive procurement) to prepare a synthesis of the evidence and lessons learned from the program. As part of this work, eight THQIT grants were selected for the case summaries presented here. The goal is to disseminate examples of projects with useful results that reflect a variety of technologies, settings, and patient populations. At the time these projects began (most more than 5 years ago), they were on the leading edge of health IT implementations focused on quality improvement. The case summaries therefore represent the positive potential of a diverse set of technologies and applications and point to some issues and challenges that must be addressed to realize the potential more broadly. They include projects focusing on electronic health records, clinical decision support, telehealth, computerized provider order entry, health information exchange, a Web-based quality reporting system with feedback, and an electronic continuity-of-care record used to help overcome barriers in accessing care.

¹ The Request for Applications for the planning grantees was number RFA HS-04-010.



Results from the Eight Cases*

The THQIT grantees experienced improved efficiencies in health care delivery, improved quality of care, and increased access to care as a result of their health IT projects. Many of the projects (six of the eight) emphasized health IT applications to improve care for vulnerable populations, such as minority and low-income groups, the elderly, children, and rural communities. For example, under one project (3), rural residents gained access to high-quality specialty care through telemedicine. Low-income residents overcame barriers to receiving care through a shared continuity-of-care record in another (5). In one project's nursing homes, the needs and health status of the elderly were better documented through an electronic health record (EHR) (2). In some cases, this improved communication about care among staff during daily shift changes.

- *Improved Efficiencies in Health Care Delivery.* Three of the eight cases used health IT to create efficiencies in health care delivery by reducing emergency department (ED) visits or lowering medication costs. In one project, the continuity of care record helped decrease the number of ED visits made by children who had experienced barriers in access to care (5). Another project enabled remote primary care consultation for children in school and child care sites in low-income areas, which resulted in fewer ED visits (8). Yet another evaluated use of formulary decision support in Massachusetts and found that insurers and patients could save on prescription drug costs (7).
- *Improved Quality of Care.* Three cases improved quality of care by decreasing the rate of a preventable health condition, increasing the likelihood that patients received life-saving treatment, or lowering the frequency of a common type of hospital-acquired infection. One of these implemented an electronic documentation system and clinical decision support in 15 nursing homes and subsequently observed a decrease of 34 percent in high-risk pressure ulcers for patients in nursing homes (2). Another found that clinical decision support for emergency medical responders resulted in lower time-to-treatment for patients experiencing heart attacks, increasing the likelihood that patients received timely life-saving treatment (1). Use of clinical decision support through an EHR system in a project in rural Iowa helped to reduce the rate of urinary tract infections after surgery (4).
- *Increased Access to Care.* Two cases increased access to care for patients experiencing barriers to access. One in New Mexico used telemedicine to extend specialist hepatitis treatment to rural patients and those in the prison system (3). Another project's continuity of care record allowed community health workers to track children's progress through the health system and apply strategies for eliminating identified barriers to access (5).

The sustainability, expansion, and transferability of a project's health IT reflects its value to project partners and other organizations considering similar technology. Many of the THQIT projects sustained, expanded, or transferred their health IT to other settings, health care areas, or populations after the grant period ended. In addition, the THQIT projects that took place in nursing home and emergency medical services settings have encouraged discussions on health IT in those settings, which are coming to health IT later than hospitals and large physician groups and have helped to develop new software features that benefit related care.





*Note: The numbers in parentheses correspond to the case descriptions in Table E.1.



- **Sustainability.** Six cases showed continued use of implemented health IT. At least three of the six health IT projects (5, 6, 8), are self-sufficient, funded by providers and/or payers that see value in continued use. The other three have also continued to use their health IT (3, 4, 7).
- **Expansion.** Six cases transferred use of implemented health IT to other sites beyond those involved in the study (1, 2, 3, 6, 7, 8).
- **Transferability.** Four of the eight cases expanded health IT to address other health conditions or assist other populations (1, 2, 3, 8). For example, the telemedicine initiative created to treat hepatitis C has expanded to other complex diseases including cardiac risk reduction, gestational diabetes, asthma, and chronic pain. The telehealth used to enable distance consultation for children will be used for elder care.


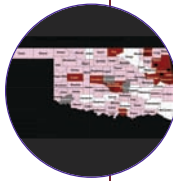
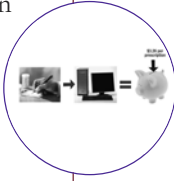



TABLE E.1. DESCRIPTION OF EIGHT THQIT GRANT PROJECTS

Grantees ²	Description	Technologies	Principal Investigator	Rural or Non-rural	Amount of Grant ¹ (AHRQ/ In kind)
Implementation Grantees					
1. Emergency Medical Service Responders Use Health IT to Improve Cardiac Care (Massachusetts)	Emergency Medical Service agencies use a Web-based quality reporting system and clinical decision support technology to improve the timeliness and quality of care provided to patients experiencing or at risk of a heart attack.	Clinical decision support and a Web-based quality reporting system	Harry P. Selker	Nonrural	(\$1,499,998 \$1,654,652)
					
2. Nursing Home Health IT Reduces Pressure Ulcers and Increases Staff's Job Satisfaction (Multistate)	Nursing homes bring health IT into long-term care to improve quality and provide guidance on translating health IT implementation lessons to new settings.	Clinical decision support and electronic health record	Susan D. Horn	Rural and nonrural	(\$1,486,451/ \$4,432,719)
					
3. Project ECHO: Extension for Community Healthcare Outcomes Through Telemedicine (New Mexico)	Through telemedicine clinics, Project ECHO provided new access to high-quality local care for rural New Mexico residents with hepatitis C. Building on this experience, the project has also initiated telemedicine clinics for other complex conditions.	Telehealth	Sanjeev Arora	Rural	(\$1,455,258/ \$1,500,000)
					
4. Network of Rural Hospitals in Iowa Redesign Patient Care Workflow to Use Electronic Health Records (Iowa)	A rural referral center implemented an EHR system and simultaneously redesigned many aspects of care delivery, improving patient safety and producing a host of new knowledge and tools for more effective EHR implementation.	Electronic health record, clinical decision support, computerized physician order entry	Donald K. Crandall	Rural	(\$1,499,869/ \$1,500,000)
					

² The official titles of the grants appear in the corresponding report sections.

TABLE E.1. DESCRIPTION OF EIGHT THQIT GRANT PROJECTS (CONTINUED)

Grantees ²	Description	Technologies	Principal Investigator	Rural or Non-rural	Amount of Grant ¹ (AHRQ/ In kind)
Planning and Implementation Grantees					
5. Public-Private Partnership Creates Web-Based System to Improve Rural Children's Access to Health Care Through a Medical Home (California)	A Web-based application that enables community health workers to ensure that patients obtain needed access to health coverage and primary care.	Continuity of care record 	Gregory W. Bergner	Rural	Planning: (\$100,000) Implementa- tion: (\$1,500,000/ \$1,500,000)
6. Replication of Health Information Exchange Framework Across Oklahoma (Oklahoma)	Using a “network of networks” model in Oklahoma makes a statewide health information exchange possible.	Health information exchange 	Mark H. Jones	Rural	Planning: (\$200,000) Implementa- tion: on: (\$1,495,308/ \$2,474,217)
Value Grantees					
7. Electronic Prescribing: Lowering Patients' Prescription Drug Costs (Massachusetts)	Providing prescribers with real-time information on the relative costs of drugs can significantly increase the use of lower cost medications.	E-prescribing with formulary decision support 	Joel S. Weissman	Nonrural	(\$1,122,244/ in-kind not required
8. Integrated Telemedicine System Demonstrates Reduction in Children's Emergency Department Visits (New York)	A telemedicine system to connect schools and child care centers to primary care physicians for telehealth consultation is expanded, resulting in reduced use of emergency departments.	Telemedicine 	Kenneth M. McConnochie	Nonrural	(\$1,464,778/ in kind not required)





1

Emergency Medical Service Responders Use Health IT to Improve Cardiac Care

Heart attacks cause one out of every six deaths in the United States (Lloyd-Jones et al., 2010). These patients tend to be older and those with chronic conditions. Quick treatment significantly increases the chance of saving a patient experiencing a heart attack. In the community, ambulance-based



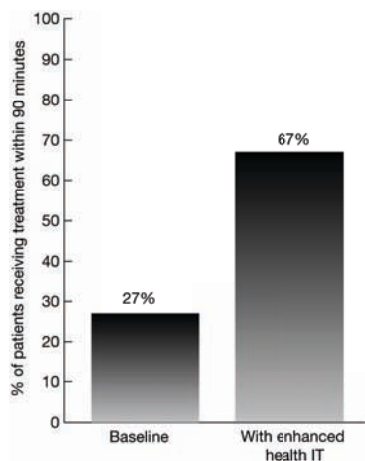
emergency medical service (EMS) responders must consider a range of patient symptoms and characteristics to determine which treatment should be initiated and which hospital is best equipped to provide additional treatment. Failure to make the right decision and delays in receiving a needed life-saving procedure for heart attack, such as percutaneous coronary intervention (PCI), can be life threatening. To do PCI, providers at special hospitals inflate a slender balloon in the patient's arteries to help the blood flow more easily to the heart. Not all hospitals are equipped to provide this treatment, and for patients who must be sent on to a second hospital to receive recommended care, only 10 percent are treated within the American Heart Association (AHA) 90-minute timeframe (Antam et al., 2004; Chakrabarti et al., 2008).

EMS agencies in two Massachusetts communities worked with researchers on an AHRQ-sponsored grant to implement two health IT systems to improve cardiac care provided. A clinical decision support (CDS) software system used electrocardiogram (ECG) results and patient information entered into the system by paramedics to determine the probability that the patient was having a heart attack and, if having a heart attack, whether PCI or clot-busting drugs were appropriate. A Web-based reporting system integrated data manually entered by EMS agencies and hospitals to measure the quality of care provided to patients from the time they called 911 to the time they began receiving hospital treatment. EMS agencies reviewed reports produced from the system to evaluate the care provided by and develop educational materials for EMS responders. As a result of this project, there was a dramatic improvement in the quality of care provided: the percentage of heart attack patients receiving treatment within the recommended 90-minute goal increased from 27 to 67 percent (Selker, 2008; Daudelin et al., 2010).

The technology is being implemented by other Massachusetts communities, and system developers have updated the technology to better serve patients. The Web-based reporting system is now connected to prehospital and hospital EMRs and has been expanded to monitor quality of care for all patients treated by EMS responders.



FIGURE 1.1. CDS TECHNOLOGY AND A WEB-BASED QUALITY REPORTING SYSTEM RESULTED IN A 150-PERCENT INCREASE IN THE NUMBER OF PATIENTS WHO RECEIVED TREATMENT WITHIN THE AHA-RECOMMENDED TIMEFRAME



Data from: Daudelin DH, Sayah AJ, Kwong M, et al. Improving use of prehospital 12-lead ECG for early identification and treatment of acute coronary syndrome and ST-elevation myocardial infarction. *Circ Cardiovasc Qual Outcomes* 2010 May;3(3):316-23.

Grant Title: EMS Based TIPI-IS Cardiac Care QI-Error Reduction System

Principal Investigator: Harry P. Selker, Boston, Massachusetts

Grant Number: This project was supported by grant number UC1 HS 015124 from 9/30/2004 to 9/29/2007.

AHRQ NRC Web Page: http://healthit.ahrq.gov/FRPT_Selker_UC1HS015124



Health IT Implementation to Address a Health Care Need

Two EMS agencies, five community hospitals, and three tertiary hospitals located in different Massachusetts communities teamed up to implement the clinical decision support technology and quality reporting system (Selker, 2008). Each community had one or more hospital able to perform PCI at least part of the time and one hospital unable to provide the treatment at all. EMS agencies, hospitals, electrocardiogram manufacturers, and a health IT company³ worked closely with researchers to develop the systems.

Clinical Decision Support Software. The project adopted CDS software, proven effective in multiple clinical trials in the emergency department (ED) setting, for use in the prehospital setting. The EMS responders entered the patient's age and symptoms into the ECG system and the software calculated the probability that a patient was experiencing a heart attack and the probability of a patient experiencing positive results or negative side effects from clot-busting drugs (Selker, 2008). The decision support probabilities were printed directly on the ECG for easier access and interpretation. Paramedics used this information to determine whether the patient should be taken to a PCI-equipped hospital, to inform the ED staff of the patient's treatment needs by radio while en route or at arrival, and initiate the treatment process to further decrease the time to treatment.

Web-Based Reporting System. The project developed a Web-based reporting system that integrated the ECGs performed by the paramedics with manually entered prehospital and hospital data on patient characteristics, diagnosis, and treatment to create a complete patient care record. From this system, the EMS agencies produced electronic reports that summarized the quality of care provided by EMS responders to patients experiencing a heart attack. The reports helped the project team to tailor quality improvement interventions for paramedics, such as education on when to perform ECGs, how to interpret them, and when to direct a patient to a PCI equipped hospital.

Key Results

After the EMS agencies and hospitals put the clinical decision software in place and began using the quality reporting system, the percentage of heart attack patients receiving treatment within the recommended 90-minute goal increased from 27 to 67 percent (Selker, 2008; Daudelin et al., 2010). The quality of care provided by the paramedics also improved. EMS responders were significantly more likely to perform and correctly interpret the ECG, use pulse oximetry, administer oxygen, and administer aspirin (Selker, 2008; Daudelin et al., 2010).

An additional benefit of the project was that each community developed treatment protocols for cardiac patients (Selker 2008). The EMS agencies and community hospitals worked together to establish guidelines for alerting the hospitals when a patient needing complex treatment was arriving.

To achieve these results, the project team had to surmount several hurdles, including negotiating competing organizational priorities, working across different settings and enabling the different organizations' computer systems to exchange information (Selker, 2008).

³ Medtronic Physio-Control, ZOLL, Philips Healthcare, and Clinical Care Solutions Inc. were the vendors for the project. The vendors provided and customized the software packages and helped with the implementation process at no cost.



In addition, the team learned that changing the culture of the EMS agencies and EDs was critical to the success of the program. The paramedics indicated that they were unaccustomed to making clinical judgments such as those encouraged by the CDS software and that some ED staff did not always trust judgments made by paramedics. Project staff used the Web-based reporting system to help increase the paramedics' confidence and convince reluctant ED staff to trust their ability to exercise sound decisionmaking.

The team also learned that providing ongoing quality feedback is important for sustaining improvements provided by the systems. After the funding for the project ended, the EMS agencies indicated that they could no longer afford to manually enter the patient data needed to produce the quality reports. The project team found that, without the quality feedback, adherence to certain clinical guidelines, such as the proper use of ECGs, decreased (Selker, 2008).

Both of the EMS agencies highlighted in this report continue to work to overcome these barriers and improve their health IT systems. They are implementing a prehospital EMR, and one agency currently is testing improvements to the CDS software.

The project team has been improving the software systems based on the results from this project, and the vendors are now selling the software to other EMS agencies. The team recognized that manual data entry for the Web-based reporting system was too labor intensive. To address this problem, Clinical Care Systems, Inc. updated the system to receive information directly from prehospital and hospital EMRs. Furthermore, the team has expanded the system to address all other areas of prehospital care, including stroke and trauma.

References

Antman EM, Anbe DT, Armstrong PW, et al. ACC/AHA guidelines for the management of patients with ST-elevation myocardial infarction: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Revise the 1999 Guidelines for the Management of Patients with Acute Myocardial Infarction). *Circulation* 2004 Aug 31;110(9):e82-292.

Chakrabarti A, Krumholz HM, Wang Y, et al. Time-to-reperfusion in patients undergoing interhospital transfer for primary percutaneous coronary intervention in the U.S: an analysis of 2005 and 2006 data from the National Cardiovascular Data Registry. *J Am Coll Cardiol* 2008 Jun 24;51(25):2442-3.

Daudelin DH, Sayah AJ, Kwong M, et al. Improving use of prehospital 12-lead ECG for early identification and treatment of acute coronary syndrome and ST-elevation myocardial infarction. *Circ Cardiovasc Qual Outcomes* 2010 May;3(3):316-23.

Lloyd-Jones D, Adams RJ, Brown TM, et al. Heart disease and stroke statistics—2010 update. a report from the American Heart Association. *Circulation* 2010 Feb 23;121(7):e46-e215.

Selker H. EMS Based TIPI-IS Cardiac Care QI/Error Reduction System. Final Report to ARHQ for Grant UC1 HS 015124; 2008.

Selker H. EMS Based TIPI-IS Cardiac Care QI/Error Reduction System. Proposal for AHRQ Grant Transforming Healthcare Quality Through Information Technology-Implementation Grants; FOA: HS-04-011; 2004.



2

Nursing Home Health IT Reduces Pressure Ulcers and Increases Staff's Job Satisfaction



Pressure ulcers are a painful, prevalent, and preventable condition that can reduce quality, affect mortality for nursing home residents (Takahashi, 2008), and add costs to the health care system (Reddy, 2006). Recognizing residents who are at high risk of developing pressure ulcers could prevent unnecessary suffering and spending. Clinical decision support (CDS) embedded in health information technology (health IT) can provide a clinician with patient-specific information and State-of-the-science care guidance (i.e., evidence-based recommendations). Although this approach has been shown to be very helpful in aiding clinicians' decisionmaking and the subsequent quality of care patients receive, nursing homes have been slow to adopt it.

AHRQ (with \$1.5 million of funding) and 15 participating nursing homes representing seven long-term care (LTC) organizations (with

\$4.5 million of funding) sponsored the initial integration of the On-Time Quality Prevention Program for Long-Term Care (On-Time) into health IT. On-Time, a quality improvement program that leverages health IT for clinical documentation and CDS, engages multiple care providers (certified nursing assistant (CNA), registered nurses, dietitians, rehabilitation staff, and so on) to work together as a team in communication and care planning as they use CDS to identify high-risk patients and to provide prompt, preventive care. On-Time reduced the percentage of residents with pressure ulcers and led to closer bedside monitoring of the skin, nutrition, and incontinence. Staff job satisfaction also improved. Although it took over a year to see results because facilities needed time to train users and to fully incorporate the system into daily activities, nursing home staffs report that they have been able to maintain these improvements in quality beyond the conclusion of the grant.

"On-Time emphasizes communication; you know the residents are better cared for; families are happy."

Staff member

The successful result of this grant laid the foundation for subsequent AHRQ funding and partnerships with the New York Department of Health, District of Columbia Office of Aging, quality improvement organizations, and others. The On-Time quality improvement process is currently embedded in health IT for 12 vendors, and an additional 50+ nursing homes across the country have adopted it.⁴ Many nursing homes using On-Time are exploring ways to expand it to address other preventable conditions such as resident falls. The team is also developing a Train-the-Trainer Guide, and a comprehensive evaluation of On-Time in New York will be completed by 2011.

⁴Twelve vendors have knowingly incorporated requirements for the five standard On-time reports and associated data elements in their software including: CareTracker® (by Resource Systems); Optimus EMR™ (by Optimus EMR, Inc.); Digital Pen Systems, Lintech, Mylex, Reliable, SigmaCare® e-Health, American Data, Healthcare Systems Connection, Point-Click-Care®, and HealthMedX™.



- The On-Time Manual (fall 2010) provides guidance on how to get started and what to expect when pursuing an On-Time QI approach, regardless of the vendor of the health IT (e.g., electronic health record) used.
- This manual and other On-Time reference materials are available at: <http://www.ahrq.gov/research/ontime.htm>, under Program Materials and Tools. An additional overview may be found at: <http://www.innovations.ahrq.gov/content.aspx?id=2153>
- Health IT vendors may request details on the process to incorporate On-Time into their software, including a standard set of On-Time requirements and overview of testing process by contacting, On-Time@ahrq.hhs.gov.

Grant Title: Nursing Home Information Technology (IT): Optimal Medication and Care Delivery

Principal Investigator: Susan D. Horn, Salt Lake City, Utah

Grant Number: This project was supported by grant number UC1 HS 015350 from 9/30/200 to 9/29/2008.

AHRQ NRC Web Page: http://healthit.ahrq.gov/FRPT_Horn_UC1HS015350



Health IT Implementation to Address a Health Care Need

This pilot project was the first iteration of integration of the On-Time Quality Prevention Program with health IT. It involved 15 nursing homes, located in seven States and the District of Columbia⁵, ranging in size from 50 to 250 beds and served both rural and urban areas. Residents primarily include the elderly, individuals with disabilities, and people needing end-of-life care. Each of the facilities selected health IT to (1) allow CNAs to electronically document the residents' behavior, weight, and skin integrity and (2) create a series of clinical reports summarizing information into meaningful trends useful in identifying residents with a high-risk of pressure ulcer development.^{6,7} The facilities used these reports to improve care processes and enhance communication among staff members (e.g., nurses, social workers, and dietitians) about the health of the residents and to develop care plans.

Each nursing home had the option to select and implement its own vendor product so that the documentation system fit the needs of the facility and the way its nursing staff completed daily tasks and communicated with each other. All vendors were provided the standard set of On-Time requirements for documentation to incorporate into their software. Facilities made technology available to their staff in a variety of ways, including hand-held devices, kiosks outside residents' rooms, and digital notepads. Some facilities used multiple technologies to address different needs. Given unique workflow and staffing levels, each nursing home implemented the technology at its own pace, based on available resources.

Key Results

Data from 12 of the 15 participating nursing homes show a promising trend toward improving resident outcomes for pressure ulcers after implementing On-Time as part of health IT adoption. The combined quarterly averages of the percentage of high-risk pressure ulcers were calculated for the 12 nursing homes which tracked that measure.⁸ These facilities had completed the health IT implementation by the fourth quarter of 2005. The percentage of residents with high-risk pressure ulcers decreased from 10.8 (in Q1, 2005) to 7.1 (in Q4, 2007), an absolute reduction of 3.7 percentage points. The percentage of residents with high-risk pressure ulcers decreased from 10.8 to 7.1, an absolute reduction of 3.7 percentage points, from 2005 to 2007. During that same period, the national average for high-risk pressure ulcers decreased only from 14 to 12, a reduction of 2 percentage points (though the difference between the national average and the nursing home average was not tested for statistical significance). In addition, feedback surveys of 336 CNAs 18 months after implementation showed improvements in job satisfaction. Compared to preimplementation surveys, a greater percentage of staff indicated that they spent the right amount of time documenting resident information, received enough information to provide quality care, and understood what needed to be done for residents.

⁵ The nursing homes were located in Wisconsin; South Dakota; North Dakota; Nebraska; Minnesota; Ohio; Washington, DC; and Arizona.

⁶ Some of the nursing homes implemented health IT for medication administration, but not until the end of the project. Because the project could not assess results for this application of health IT, this report does not cover it.

⁷ The vendors used in the project for clinical documentation and clinical decisionmaking reports included Resource Systems-CareTracker®, Optimus™ EMR Point-Click-Care®, Digital Pen Systems, MDI Achieve, and Hands-On (an internally developed system). Some nursing homes may have switched vendors since the grant ended.

⁸ Data are for 12 of the 15 nursing facilities because 3 did not have quality measure data.



Because nursing homes participated voluntarily, the results may be biased due to disproportionate inclusion of facilities that have experience in quality improvement and are capable of implementing complex systems like health IT. In expanding implementation of the On-Time approach to other nursing homes, those that could fully implement the health IT and On-Time process experienced pressure ulcer reductions similar to those in the initial study. Nursing homes that partially implemented the health IT and the On-Time process experienced smaller improvements. According to project staff, full implementation includes the following:

- Using health IT clinical systems for daily CNA documentation that meet On-Time requirements.
- Establishing audit and feedback processes to confirm that documentation is complete.
- Using clinical decisionmaking reports for communicating and care planning with a multidisciplinary team.
- Using tracking forms to monitor progress of implementation strategies.
- Providing an ongoing review of key outcome measures with front-line staff.

Since the project's conclusion, the nursing homes have found new ways to use the electronic documentation system to improve patient care. All 15 nursing homes have expanded into other areas of documentation and quality improvement.

With AHRQ funding for technical assistance for On-Time implementation in nursing homes, more nursing homes have adopted health IT for clinical documentation and implemented On-Time through other grant projects. An additional 21 LTC facilities across the country implemented this approach in 2007. Nine of these 21 facilities that fully implemented the health IT and On-Time process achieved an absolute reduction of 4 percentage points, the percentage of residents with high-risk pressure ulcers declined from 13.1 to 9.1 percent.

Another 46 facilities in the District of Columbia and New York began implementation in 2008, with government organizations (the Washington, DC Office on Aging and the New York Department of Health) using financial incentives to encourage nursing home health IT adoption coupled with an explicit approach to improve care processes.

"[At the beginning of the project] we had to practically beg [health IT] vendors to incorporate the set of On Time reports into their system. Since then there has been a growing recognition that the value of health IT comes from impacting clinical decisionmaking, not just automating the paper documentation process, and On Time reports can add value to a vendor's system."

Susan D. Horn, Principal Investigator



References

Available at: Agency for Healthcare Research and Quality. Research Findings. Long-term care. <http://www.ahrq.gov/research/ontime.htm>. Accessed September 2010.

Available at: Agency for Healthcare Research and Quality. Innovations. <http://www.innovations.ahrq.gov/content.aspx?id=2153>. Accessed September 2010.

Kaiser, Medicaid and Long-Term Care Services and Support. Available at: http://www.kff.org/medicaid/upload/2186_06.pdf.

Kaiser Commission on Medicaid and the Uninsured. Changes in characteristics, needs, and payment for care of elderly nursing home residents: 1999 to 2004; June 2007.

Reddy M, Gill SS, Rochon PA. Preventing pressure ulcers: a systematic review. JAMA 2006 Aug 23;296(8):974-84.

Takahashi PY. Pressure ulcers and prognosis: candid conversations about healing and death. Geriatrics 2008 Nov;63(11):6-9.

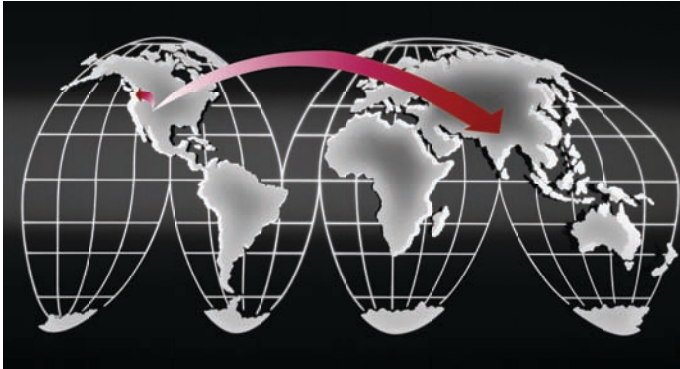
Wiener JM, Freiman MP, Brown D. Nursing home care quality twenty years after the Omnibus Budget Reconciliation Act of 1987. Kaiser Family Foundation; December 2007.





3

Project ECHO: Extension for Community Healthcare Outcomes Through Telemedicine



To help address rural residents' problems in accessing specialty care for complex conditions, Project ECHO—Extension for Community Healthcare Outcomes—connects urban specialists with rural practitioners through the Internet. Based at the University of New Mexico (UNM), the project goes beyond many telemedicine projects, not only enabling patients to be treated long-distance but also

honing the ability of rural practitioners, i.e., primary care physicians, nurse practitioners, physician assistants, and pharmacists, to provide specialty care for chronic and potentially debilitating conditions. Through one-to-many videoconferencing, clinicians hone their clinical skills and share a deepened, interconnected professional community.

"We're developing our knowledge networks so that every doctor can provide best practice care without being an expert in all chronic diseases."

*-Dr. Sanjeev Arora
Principal Investigator*

In New Mexico, hepatitis C is a prevalent and costly condition that often leads to death if untreated. This ground-breaking project improved access to care for 4,000 rural residents with hepatitis C through provision of telemedicine care at 21 rural telemedicine facilities, 16 community centers, and 7 department of corrections facilities. Over time, these researchers have expanded this telemedicine model to address other potentially debilitating conditions requiring specialty care within the State of New Mexico. On a regular weekly schedule, specialists at UNM teach and provide medical care through 2-hour telemedicine clinics to the full set of locations shown in Table 3.1. The process works well

for providers: 84 percent of surveyed providers said that access not only to medical experts but also to specialists in behavioral and mental health was helpful.



TABLE 3.1. TYPES OF CONDITIONS AND NUMBERS OF FACILITIES USING PROJECT ECHO TELEMEDICINE MODEL FOR IMPROVED HEALTH CARE TREATMENT

Condition	Number of Facilities
Original Focus:	
Hepatitis C	21
Expanded to These Conditions and Facilities:	
Asthma/Pulmonary	16
Child, Adolescent, and Family Psychiatry ^a	32
Child, Adolescent Psychology ^a	14
Chronic Pain/Headache	9
Diabetes/Cardiovascular Risk Reduction	19
High-Risk Pregnancy	21
HIV/AIDS	17
Integrated Addiction/Psychiatry	14
Medical Ethics	7
Occupational Medicine	5
Pediatric Obesity	43
Psychotherapy	4
Rheumatology	11

^a Both types of telemedicine clinics address child and adolescent mental health issues; however, the psychiatry clinics work with rural physicians who may prescribe psychiatric medications, whereas the psychology clinics work with nonphysician staff to provide effective psychological counseling.

The project is expanding far beyond New Mexico. In June 2007, the project was selected by Changemakers in partnership with RWJF as a winner of their international search for Disruptive Innovations in Healthcare – New Models, and work is under way to bring the model to the University of Washington, University of Chicago, and several universities in India.

Grant Title: Project ECHO: Extension for Community Healthcare Outcomes

Principal Investigator: Sanjeev Arora, Albuquerque, New Mexico

Grant Number: This project was supported by grant number UC1 HS 015135 from 9/30/2004 to 8/31/2008.

AHRQ NRC Web Page: http://healthit.ahrq.gov/FRPT_Arora_UC1HS015135



Health IT Implementation to Address a Health Care Need

New Mexico is one of many States wrestling with the problem of access to specialty care for rural citizens with complex health conditions. Through Project ECHO's telemedicine initiative, the State turned its attention to hepatitis C because UNM estimated that, left untreated, the disease would claim the lives of over 2,000 residents from 2010 to 2019, many of whom would be young (Arora, 2008). Prison inmates in the State also have high rates of hepatitis C and limited access to specialty care. Because most prison inmates leave prison at some point, their illness carries public health and economic implications far beyond the prison walls.

Better access to treatment in rural New Mexico has the potential to reduce both deaths and costs because hepatitis C is curable in 45 to 81 percent of patients through 6 to 18 months of injection therapy (Arora, 2010). However, specialists in the disease are concentrated in the UNM Health Sciences Center in Albuquerque. Indeed, nearly all the counties in the State have been designated by the U.S. Department of Health and Human Services as "medically underserved areas" (32 of 33) and almost half as health professional shortage areas (14).

"By co-managing patients with UNM specialists, we're bringing case based learning back into the lives of rural providers."

Dr. Arora, PI

Before Project ECHO, rural practitioners rarely felt qualified to administer treatment for hepatitis C for sound reasons: it causes severe side-effects such as anemia, neutropenia (another blood disorder), and depression, which discourage patients from complying with treatment and must be carefully managed.

To implement the project, UNM recruited 21 rural partner organizations through health care conferences, presentations, and preexisting partner contacts. The rural partners include public-sector health care providers—Indian Health Service Hospitals, the New Mexico State Health Department, and seven prisons of the New Mexico Department of Corrections—and 10 Federally Qualified Health Center sites.

Experts from UNM came to the partner for an on-site training workshop. Telemedicine experts helped install HCV Care Manager,⁹ the interface between UNM and the partner sites. This software shifted beginning in 2008 to an Internet-based tool (iHealth, by Infosys Technologies, Inc.), which is used in conjunction with video equipment installed by Project ECHO staff. The internet tool allows all partners to access information from remote sites, with Health Insurance Portability and Accountability Act-compliant controlled access to protect confidentiality. In addition to receiving training on use of the software, partner clinicians shadowed specialists at the UNM for 1 to 2 days to experience an HCV clinic.

During weekly telemedicine clinics, there is a 15-minute teaching segment offered by specialists at UNM and the partner practitioners take turns presenting cases in a standard case-based format. For the hepatitis C clinic, the specialists include experts in gastroenterology, infectious disease, psychiatry, substance abuse, and pharmacology. The topics discussed included treatment complications as well as psychiatric, medical, and substance abuse issues. As of this writing, 400 hepatitis C telemedicine clinics involving over 6,000 patient consultations have been held. Attendance averages 12 rural providers per week.

During the grant period, the project began to expand to other clinical conditions, and that expansion has continued since the end of the grant. To be deemed appropriate for the project, the condition must: (1) be common, (2) have serious consequences, (3) result in a high societal cost without treatment, (4) require complex management, and (5) be one for which effective specialty treatment exists. The project has not yet been able to identify a way to sustain itself without public/grant funding.

⁹ Software designed by the Liver Research Institute, Denver, Colorado, in collaboration with Project ECHO. (HCV stands for hepatitis C virus).



Key Results

Project ECHO worked well for providers and patients. Ninety-two percent of the 29 surveyed providers believe that they can care for their patients competently because of the project (Arora et al. 2007).

Over 4,000 hepatitis C patients have entered Project ECHO since it began. Although quantitative estimates are not available, more patients were treated than would have been treated without the program. Of the 2,300 prisoners in the corrections system diagnosed with hepatitis C, none had been treated before the project was launched. University programs, including the UNM specialty clinic, typically treat only about 50 patients at any given time. Of importance is that the project has succeeded in providing care that equals the quality of the care provided by the hepatitis C clinic at UNM. The proportion of patients cured of the hepatitis C virus in the rural and prison sites was 50 percent for genotype 1/4 and 70 percent for genotype 2/3 patients. In comparison, UNM hepatitis C patients had cure rates of 46 and 71 percent, respectively. There was no statistical difference between the ECHO and UNM sites. The study population in Project ECHO was 68-percent minority versus 49 percent for the UNM population. This suggests the project has worked to reduce a disparity in access to high-quality care among the State's minorities.

AHRQ provided key start-up funding through the THQIT grant; State start-up funding was also critical. Project ECHO staff estimate that pharmaceutical firms have donated more than \$3 million in no-cost pharmaceuticals for patients in the project through indigent drug replacement programs.

The Project ECHO model is believed to be widely transferrable. To facilitate that process, project staff are drafting a "replication manual," which is expected to be available in summer 2011 on UNM's Web site <http://echo.unm.edu/>. At present, the University of Washington has replicated the model and is treating hepatitis C at 15 rural sites.

Hepatitis C is a global as well as a national problem, with 170 million carriers worldwide and 3 to 4 million new cases each year (World Health Organization 1999). Project ECHO shows that the same telemedicine model can address not only hepatitis C but also other complex conditions that exist both in the rural United States and around the globe in areas devoid of specialist clinicians.

References

Arora S. ECHO: Extension for Community Healthcare Outcomes. Final grant project report to AHRQ, 2008.

Arora S. ECHO Project: Extension for Community Healthcare Outcomes. Presentation slide set provided to Mathematica; per author the project information was updated to March 2010, received by Mathematica April 13, 2010.

Arora S, Geppert CMA, Kalishman S, et al. Academic Health Center Management of Chronic Diseases through Knowledge Networks: Project ECHO. *Acad Med* 2007 Feb;82(2):154-60.

Arora S, Kalishman S, Thornton K, et al. Expanding access to hepatitis C virus treatment—Extension for Community Healthcare Outcomes (ECHO) project: disruptive innovation in specialty care. *Hepatology* 2010 Sep;52(3):1124-33.

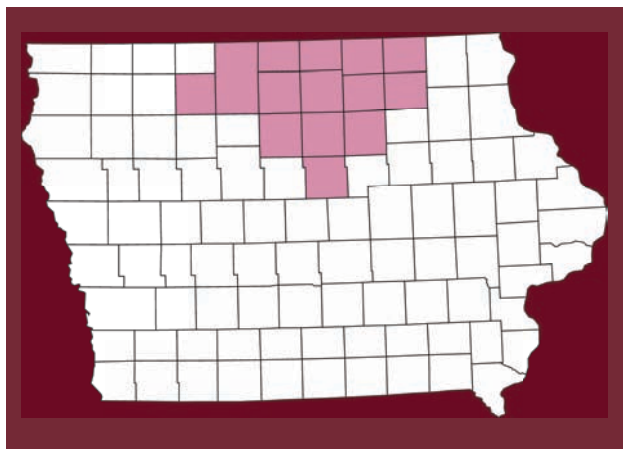
Arora S, Thornton K, Jenkusky SM, et al. Project ECHO: linking university specialists with rural and prison-based clinicians to improve care for people with chronic hepatitis C in New Mexico. *Public Health Rep* 2007;122 Suppl 2:74-7.

World Health Organization. *Wkly Epidemiol Rec* 1999 Dec 10;74(49):421-8.



4

Network of Rural Hospitals in Iowa Redesign Patient Care Workflow to Use Electronic Health Records



In addition to electronically storing patient's information in an accessible and standardized fashion, electronic health records (EHRs) can support a variety of more sophisticated functions, including clinical decision support (CDS), which facilitates clinicians' decisionmaking, through the integration of patient-specific information and established clinical guidelines. Although EHRs have been shown to be a useful tool for improving health care quality and safety, health care organizations have come to recognize that just having an EHR does not equate to

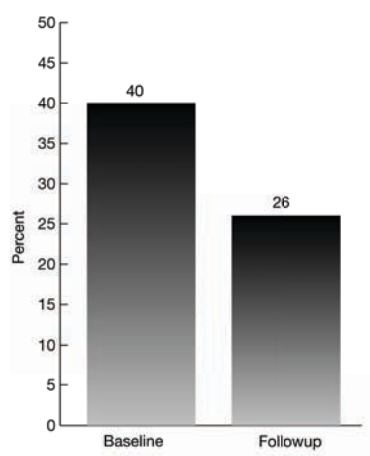
quality improvement. Health care organizations must rethink the processes of patient care as they implement EHRs to ensure that patient care workflow matches EHR functions, if improvements in health care quality are to be realized. A regional referral hospital in rural Iowa did that, illustrating the synergy between EHRs and the redesigning of care processes and how such synergy can generate benefits for patients. The following are examples of their successes:

- Pharmacists from the rural referral center hospital now use the EHR system to remotely check medication dosing and drug alerts for critical access hospitals in their network, helping to avoid medical errors in pharmacy care for hospitalized patients in rural Iowa.
- CDS featuring automatic alerts and notifications within EHRs helped improve the timeliness of indwelling catheter¹⁰ removal, thereby decreasing urinary tract infections (UTIs) after surgery, a complication that can result in worsened patient outcomes and longer hospitalizations (see Figure 4.1).

¹⁰ A catheter that is inserted into the bladder and allowed to remain.



FIGURE 4.1. FEWER POST-ELECTIVE-SURGERY URINARY TRACT INFECTIONS OCCUR AFTER WORKFLOW REDESIGN TO USE ELECTRONIC ALERTS AND REMINDERS IN EHRs



Note: Baseline period was April 2008 through March 2009. The CDS process to help prevent UTIs was implemented during January-June 2009. The followup period was annualized to 1 year from 6 months of data for the period July-December 2009.

Grant Title: Rural Iowa Redesign of Care Delivery With EHR Functions

Principal Investigator: Donald K. Crandall, Mason City, Iowa

Grant Number: This project was supported by grant number UC1 HS 015196 from 9/30/2004 to 12/31/2007.

AHRQ NRC Web Page: http://healthit.ahrq.gov/FRPT_Crandall_UC1HS015196



Health IT Implementation to Address a Health Care Need

To transform the quality and efficiency of care, Trinity Health, based in Novi, Michigan, developed “Project Genesis,” a system-wide IT strategy and implementation model that was launched in 2001 and by 2010 was rolled out to 29 of Trinity’s 40 hospitals. The AHRQ Transforming Healthcare Quality through Information Technology (THQIT) grant supported the first rural implementation in the Trinity system at Mercy Medical Center-North Iowa (Mercy Medical).

Mercy Medical is located in a rural area with a high percentage of elderly residents (age 85 and older) and few specialists. Nine critical access hospitals are associated with Mercy Medical and are linked to it through a shared management structure. Before Project Genesis was implemented, pharmacy coverage for the critical access hospitals was problematic; a hospital pharmacist would be available only intermittently, or a retail pharmacist would work for the hospital only a couple of days per week.

Before the implementation grant was received, Mercy Medical had been working with the Trinity system to implement some health IT, including a central clinical data repository, an EHR viewer (for dictated physician reports, lab results, and diagnostic reports), a pharmacy medication profile, and an adverse drug event rules package involving drug-laboratory alerts to the pharmacy. During the grant period, Mercy Medical put many more improvements in place: a new patient management system and a suite of clinical applications that included nurse documentation, electronic ordering of tests and medications (computerized practitioner order entry with order sets), electronic alerts and reminders based on evidence-based guidelines for care (clinical-decision support); a new pharmacy system; a new medical records management system; an emergency department tracking system; and a new radiology system.¹¹

The lessons learned from Mercy Medical’s implementation experience have been documented in at least nine publications to date, which also present related tools and descriptive information on patient safety issues based on information from the system supported by the grant. Selected lessons are highlighted below.

¹¹ Cerner PowerChart® (at the hospital) and Cerner PowerChart Office™ (in the clinics) are the electronic health record. Many other products were also installed as part of the implementation, including Discern Expert and Explorer (for the alerts and reminders), PowerOrders/PowerPlans with Interdisciplinary Plans of Care), Cerner Communications Language reporting (real-time reports going to physicians), and PharmNet® (for the pharmacy).



Key Results

In contrast to the unreliable pharmacist coverage available before the grant, the Mercy Medical pharmacists now use the EHRs remotely to provide a solid second layer of medication safety for rural patients, complementing the physician's own oversight. This second layer of safety is routine in urban areas. Pharmacists play an important role in ensuring that medication dosing is correct; for example, they calculate all medication dosing for children.

With the new system, a physician can view a patient's chart from anywhere within the Trinity Health system and its linked critical access hospitals. This improvement makes it easier for the surgeons and specialists who often travel between Mercy Medical and the critical access hospitals to provide good continuity of care for patients from any location.

EHR use at Mercy Medical reduced UTIs after elective surgery from 40 to 60 percent (Figure 4.1). Trinity reports equivalent or better reductions in this measure at other hospitals that implemented the EHR as well. UTIs account for nearly a third of all hospital-acquired infections. Although catheters are a common source of infection, they are often needed among hospitalized patients (particularly in the intensive care unit). However, the longer a catheter is in place, the greater the risk of infection. Trinity Health, including Mercy Medical, implemented a "clinical decision support" rule in its EHR to reduce infections by encouraging only appropriate use and timely removal of catheters consistent with medical guidelines. First, clinicians automatically view updated guidance from the Centers for Disease Control and Prevention within the ordering steps for an indwelling catheter, and they must document appropriate rationale for insertion. The ordering sentence requires an appropriate reason for use of the catheter. The system sets a reminder note (task) for a nurse to perform and document the insertion. Second, the electronic system provides the nurse with a reminder at 24 hours to determine whether the catheter should be removed, and if not, then why. This rule helped to solve a simple but unfortunate problem: when the researchers explored the reasons for catheters being left in for longer than recommended, they found simple lack of awareness of the catheter was an issue.

The UTI-related clinical decision support (CDS) is one example of what were 54 CDS rules initially implemented when Mercy Medical converted to the EHR system, and the number has since grown to 235. The positive results discussed here and seen system-wide for reduction in UTIs have not been consistently seen across facilities for the more than 300 CDS rules maintained by the system. Trinity has found that positive results are more likely when the CDS rule fits well with the workflow at the facility implementing it—and not all facilities have the same workflows. Work funded by the THQIT grant helped Trinity develop a model for design, validation, and evaluation of CDS rules with the workflow process in mind.



Although many health care organizations worry that they will suffer financially when they implement an EHR system, this does not seem to have been the case for Trinity Health. Table 4.1 shows that the system has remained sustainable despite major investments at both the system level and at each hospital as it prepares for conversion. Although the rethinking of patient care before converting to EHRs requires much staff time and energy, staff have identified how to make the care process more efficient and higher in quality.¹²

TABLE 4.1: OVERALL HEALTH SYSTEM INDICATORS DURING YEARS OF ELECTRONIC HEALTH RECORD IMPLEMENTATION

Indicators	2004	2005	2006	2007	2008	2009
Average Length of Stay ¹³	4.68	4.64	4.46	4.43	4.46	4.35
Operating Margin	2.65%	2.75%	5.87%	5.3%	5.7%	3.1%

For example, to redesign workflows, Mercy Medical clinical staff and members of the hospital's EHR implementation team worked side by side to document and map the steps typically needed to complete work before the EHR was activated. Prototype workflows that integrated the new technology were developed by system-level staff at Trinity Health. Then, in a day-long working session and in periodic followup sessions for clinicians, the clinicians and the hospital implementation teams assessed the proposed workflows against current practice. Session participants recorded content gaps between current and future care processes in terms of the questions "who, what, when, and where" with respect to steps in the workflows. The questions elicited ways to reduce variation and eliminate waste in the practices of individual workers or units. Comparisons across units about who would document and use EHR information brought to light unjustifiable variations from worker to worker and from unit to unit. Through these comparisons, clinicians raised safety concerns or questioned the quality of current care processes. By redesigning the workflows, clinicians accepted many aspects of the future work flow to further evidence-based standardized care that could enhance safety and efficiency.

¹² From the hospital's perspective, rethinking the care process is known as redesigning "workflows."

¹³ The general decrease over time in average length of stay approximately mirrors the national decrease.





5

Public-Private Partnership Creates Web-based System to Improve Rural Children's Access to Health Care Through a Medical Home



Many residents of California's rural El Dorado County struggle to gain access to appropriate health care, facing barriers such as lack of insurance and a shortage of medical providers who accept public insurance. El Dorado County is a rural jurisdiction on the Nevada border, with an economy comprised mostly of its many small businesses. Its two main population centers, Placerville and South Lake Tahoe, are split by the Sierra Nevada Mountains, with Placerville located on the western foothills, and South Lake Tahoe on

the eastern slope. To help these residents of the topographically divided area get the care they need, a group of public and private agencies came together to form Access El Dorado (ACCEL), a partnership dedicated to improving access to and quality of health care in the community. ACCEL consists of 12 partner organizations, including government agencies, community and rural health centers, a federally qualified health center, a tribal clinic, private physician practices, and two hospitals.

ACCEL developed a set of ongoing initiatives based on the Care Pathways model, which uses community health workers (CHWs) to help guide individuals through an often complex health care bureaucracy and connect them to the care they need. Each "pathway" consists of steps to overcome a particular access-related problem. For example, the "Obtaining a Medical Home" (OMH) pathway helps link children who visit emergency departments to a medical home by finding a primary care provider (PCP) who accepts their insurance. Other ACCEL Care Pathways initiatives include efforts to:

- Help parents obtain insurance for their uninsured children.
- Review clients' eligibility to help them keep the coverage they already have.
- Enroll eligible newborns in California's Medicaid program (Medi-Cal).
- Connect mental health providers with PCPs to ensure that patients' mental health needs are met.

Funding from a pair of AHRQ THQIT grants allowed ACCEL to develop and implement a Web-based application (iREACH) to manage the system that has permitted Care Pathways to more efficiently and effectively serve a larger number of individuals.

Secondary benefits of that expansion include a nearly 25-percent reduction in the use of emergency departments among children enrolled in the OMH pathway. With the trust developed between ACCEL partners through the collaborative planning process, all partners have adopted iREACH and major health care providers have agreed to fund ongoing operating costs such as maintenance, licensing, and Internet connectivity. This shared vision is critical in motivating care providers to find ways to maintain and improve the program, even in a challenging economic environment.

"I feel that iREACH has been extremely efficient. I just know from before, it's a much less tedious process, more streamlined...the paper process was bogging us down."

IREACH user



Grant Title: EL Dorado County Safety Net Technology Project/Access EL Dorado County (ACCEL)

Principal Investigator: Gregory W. Bergner, South Lake Tahoe, California

Grant Number: This project was supported by grant number P20 HS 014908 (Planning) / UC1 HS 016129 (Implementation) from 9/30/2004 to 9/29/2005 and 9/30/2005 to 9/29/2009, respectively.

AHRQ NRC Web Pages: http://healthit.ahrq.gov/FRPT_Bergner_P20HS014908 and http://healthit.ahrq.gov/FRPT_Bergner_UC1HS016129



Implementing Health IT to Address a Health Care Need

For these initiatives to succeed, ACCEL needed to track patients across many different clinicians and ensure that each was taking the steps necessary to surmount patients' access barriers. Tracking patients' progress through the pathways represented a particular challenge for ACCEL because of the number of health care organizations involved and the geographic isolation of providers in mountainous, rural El Dorado County. ACCEL proposed using THQIT grant funds to develop an "electronic information hub" to coordinate care as the collaborative continued implementing and expanding the Care Pathways program. ACCEL designed a Web-based application (iREACH)—with this tool, all clinicians could enter information on patients, clearly delineating each clinician's responsibilities and permitting verification of task completion.

FIGURE 5.1. STEPS IN OBTAINING A MEDICAL HOME PATHWAY

1) Patient visits Marshall Medical Center emergency department (ED) and is identified as having no medical home.
2) Referral specialist at ED inputs patient information into iREACH Web-based data management tool. Referral is sent via iREACH to Public Health Division Community Health Worker (CHW).
3) CHW calls patient and primary care provider and schedules appointment.
4) Primary care appointment held.
5) Referral specialist notes in iREACH that patient had primary care appointment. Pathway closed.

Several iREACH components help to ensure that the patients ACCEL serves are successful in overcoming the targeted access barriers. Features that improve case management include:

- Ability for workers to check the status of a patient to see which steps in the pathway are complete and which are still pending.
- Detailed information about how to complete each pending task.
- Free-text fields for users to input comments on patients' cases so that other users can take over managing a case more seamlessly when necessary.
- Automated email messages that remind users of a pending task.

Another important component is the system's ability to generate reports. Centralizing data on all patients permits creation of aggregated reports for quality assurance and system improvement.

ACCEL overcame multiple difficulties while implementing iREACH. The collaborative invested the first 2 years of the grant in obtaining input from providers on:

- Designing the tool to maximize its usefulness in tracking patients.
- Minimizing providers' burden in using the system.
- Making it compatible with providers' preexisting health IT tools and ways of managing Care Pathways.



Coming to agreement on the design of a shared tool that would systematize management of patients' cases was time consuming because providers previously varied greatly in how they handled enrollees. After consensus was reached, ACCEL staff, which were knowledgeable about both public health case management and IT tools, acted as a bridge between the users and Infocom, the iREACH vendor, to customize the application according to the specifications agreed to by the ACCEL's partner organizations.

By the final year of the grant, all ACCEL partners were using iREACH consistently, and have continued to do so since. During the third year of the grant, ACCEL trained the users, including referral specialists and CHWs, for the launch using day-long group demonstrations and ad hoc sessions. Training was accompanied by case studies developed by ACCEL, which walked users through the iREACH process based on different patient scenarios. During the first few months after the launch, ACCEL also acted as a conduit of information between users and Infocom to fix system bugs and modify processes based on user feedback.

A great success [of the AHRQ-funded planning process] was creating a community of trust and commitment among the partners, so that they perceived those being served as "our" patients rather than "yours" or "mine."
ACCEL program director

Key Results

Interviews with iREACH users highlighted the value of this initiative. As illustrated by the quote in the introduction, users found that the technology increased efficiency and reduced errors in tracking patients. Prior to iREACH, CHWs relied on faxes and phone calls and tracked information via paper files. The electronic format aided in storing and providing access to needed information. That perception of increased efficiency is borne out in the number of hours required to manage individual cases, which are 23 percent lower with iREACH than under that paper process (Bergner et al., 2009).

Between the period before the implementation of iREACH until the end of the grant when all partner organizations had adopted the tool, Care Pathways has:

- Arranged for more than 4,000 children to acquire health care coverage.
- Successfully assisted 92 percent of children to re-enroll in health insurance programs.
- More than doubled referrals to mental health treatment.
- Established a medical home for 358 (86 percent) of children seen in the Marshall ED.

ACCEL also documented patients' health outcomes. Among children enrolled in the OMH pathway, emergency room visits decreased. In the year prior to enrollment, children had an average of 1.5 ED visits, while in the 12 months after enrollment, the average declined to 0.9. In addition, the percentage of children who were high-frequency ED users (3 or more visits in a year) decreased by more than one-fourth, from 12.1 to 8.8 (Bergner et al., 2009).

Reference

Bergner GW, Dunn SD, Dickson K, et al. El Dorado County Safety Net Technology Project / ACCESS El Dorado. Final Report to the Agency for Healthcare Research and Quality, December 2008.



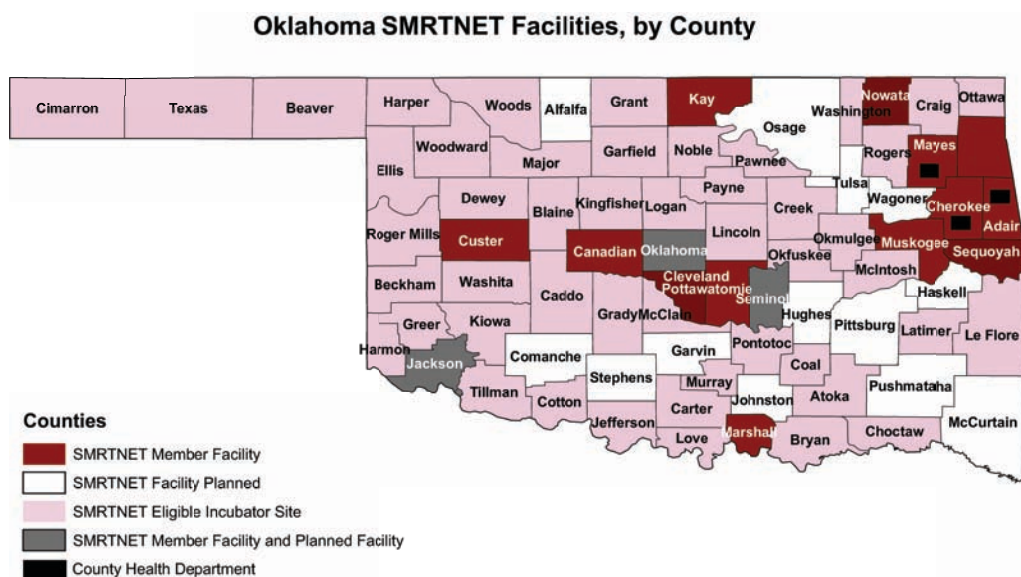
6 Replication of Health Information Exchange Framework Across Oklahoma

In the United States, patients often see multiple clinicians for care, and their medical information is scattered across various providers. This system can be fragmented, less efficient, and as such, inappropriate or insufficient care may be provided. States like Oklahoma are addressing this fragmentation via a health information exchange (HIE), which can make it easier for providers to share patient information.

Oklahoma's health status is consistently ranked as one of the lowest in the Nation, regularly falling anywhere from 46th to 49th place over the past decade. Its health care system also ranked low in national efficiency rankings (Commonwealth Fund, 2009). To improve quality of care and reduce fragmentation, seven Oklahoma health organizations and a county government entity partnered on a pair of AHRQ-sponsored grants to build an easily replicable and potentially cost-effective framework for HIE. The developed framework consisted of task forces organized around five primary areas—clinical task force, privacy task force, legal task force, technology task force, and governance task force. Since the grant period ended, the partnerships have successfully replicated the HIE framework in additional counties in Oklahoma at low cost, as shown in Figure 6.1. The HIE is now financially self-sufficient, running on member fees and contributions from networks in development; it receives no grant or other government funding. The Secure Medical Records Transfer Network (SMRTNET), a publicly owned utility company operated by its members, runs the HIE. SMRTNET members include hospitals, community health centers, mental health agencies, public health agencies, universities, and Native American health agencies.

Although it is still too early to know for sure, the SMRTNET model appears to be transferrable to other States, as evident in recent SMRTNET activities in developing an HIE in Tampa Bay, Florida. The model's success in Oklahoma has led to conversations between SMRTNET staff and hospitals and providers in other States as well, including Illinois (Chicago), Iowa, and North Carolina.

FIGURE 6.1



Grant Title: Health Improvement Collaboration in Cherokee County, OK/Implementation of Health Improvement Collaboration in Cherokee County, Oklahoma

Principal Investigator: Mark H. Jones, Tahlequah, Oklahoma

Grant Number: This project was supported by grant number P20 HS 015364 (Planning)/ UC1 HS 016131 (Implementation) from 9/30/2004 to 9/29/2005 and 9/30/2005 to 9/29/2008, respectively.

AHRQ NRC Web Pages: http://healthit.ahrq.gov/FRPT_Jones_P20HS015364 and http://healthit.ahrq.gov/FRPT_Jones_UC1HS016131



Health IT Implementation to Address a Health Care Need

In 2004, a multistakeholder partnership funded by a \$200,000 planning grant from AHRQ discussed the possibility of an HIE in Cherokee County, a rural county in which 30 percent of its population self-identifies as American Indian and 25 percent as uninsured (OHCA, 2009). The planning phase allowed key staff from the partner organizations, many of whom had never met before, to build relationships and develop ideas for coordination. This phase provided the foundation for developing the HIE, which the partnership began implementing in 2005 with \$1.5 million from AHRQ and another \$2.5 million in in-kind resources from the partner organizations.

The partnership constructed an HIE that offers services to a variety of provider types, uses privacy standards to safeguard patient information, supplies a standard data-sharing agreement applicable to different providers, and operates under a governing structure that is mutually acceptable to all stakeholders. To develop the HIE, an expert from each participating entity actively participated in five task forces during implementation:

- A *clinical task force* identified basic patient data that providers would need to treat new patients in a variety of settings, including emergency departments and inpatient and outpatient settings. The dataset included demographics, allergies and reactions, diagnoses, procedures, laboratory results, medications, immunizations, and others.
- A *privacy task force* concluded that a combination opt-in, opt-out process for obtaining patient consent would best fit patient needs and legal requirements. The task force created explanatory materials for patients as well as forms that enabled patients to opt out of the data system.
- A *legal task force* developed a common legal document to permit the exchange of data. As envisioned, the document would be acceptable to most providers regardless of their status as private entities, public organizations (for example, public health agencies), or providers within a Native American tribe. Providers can use the resulting document for planning new networks throughout Oklahoma and, although not yet attempted, other States—particularly those with Native American tribes—may be able to adapt the document to their conditions as they plan for HIE.
- A *technology task force* developed a template of data requirements for the HIE platform and used a detailed bidding process to choose a vendor that could connect a wide variety of electronic health systems. The system remains “vendor agnostic.”
- A *governance task force* created a governance structure as well as a business and sustainability plan for the HIE. It chose a “network of networks” model, which consists of local or regional groups of major health facilities forming their own data exchanges that share information under the aegis of SMRTNET, a larger public, nonprofit entity that both supplies the technical and legal infrastructure for data exchange and considers the interests of the overall group of networks.

Under SMRTNET’s model, local or regional networks have their own boards and make governing decisions based on the needs of their communities. For example, SMRTNET charges networks annual membership fees on a sliding scale, but one local network set its membership fees higher than the SMRTNET fee so it could fund the connection of local indigent clinics to HIE and pay for a full-time person to train physicians on accessing data. As the HIE platform grows to allow different service options, networks will be able to determine which services they should expand and offer to members. Member

“This started as 1 network with 4 health facilities and 400,000 records, and it grew to 5 networks across Oklahoma with 49 health facilities and 37 million records in 2.5 years.”

Mark H. Jones, Principal Investigator



facilities (i.e., hospitals, community health centers, public health agencies, and universities), along with their staff and affiliated physicians, can access all patient information in the SMRTNET system, regardless of the network in which the patient resides. As a result, the patients' information follows them no matter where they seek care. Physicians unattached to a member facility can join a network and SMRTNET via a connection through their own electronic health record (EHR), although the push to connect individual practices is just starting, and none are currently members. Member physicians can access SMRTNET online at <http://www.smrtnet.org> and retrieve a document that summarizes the basic data for any patient in the system.

To make HIE feasible for hospitals, clinics, and physicians practicing in rural areas far from existing networks, SMRTNET created a network that is accessible to all qualified health providers across Oklahoma. Its members can retrieve data but are not obligated to share patient information until they have an EHR in place. This network both extends the benefits of HIE to providers and their patients who otherwise could not access it and allows providers to build or join local or regional networks of their choice when they are ready.

Key Results

By September 2008, SMRTNET had established data exchanges in northeastern Oklahoma and Oklahoma City. As of May 2010, SMRTNET included five operational data exchanges and two exchanges that have completed planning and are transitioning to construction. SMRTNET has 49 member organizations and a data system that contains information on 37 million medical encounters, representing 3 million patients and the records of 11,000 providers. When the planned exchanges become operational (expected by the first quarter of 2011), SMRTNET is expected to cover 70 percent of the State's population. The HIE's expected expansion is illustrated in Figure 6.1, which shows existing counties in which SMRTNET members exchange data and highlights future counties that have facilities in planning.

Despite its accomplishments, SMRTNET is still in development and has not yet evaluated the impact of HIE on specific patient outcomes or the cost savings from increased efficiencies. Before joining SMRTNET, the hospitals that make up the Oklahoma City data exchange analyzed SMRTNET's potential to improve patient care and system efficiencies. Using their own data, the hospitals projected that the HIE could save them \$14 million annually by reducing hospitalizations, emergency department (ED) visits, and redundant laboratory tests for uninsured patients and by decreasing the time that ED staff devote to searching for patient data. The data exchange, which now includes 17 hospitals, has not yet assessed whether expected improvements in care or cost savings have resulted from participation in SMRTNET.

In establishing the HIE, member facilities and SMRTNET learned that encouraging clinicians to use the data requires providing them with a rich database, followed by on-site training, assistance with workflow issues, and identifying a clinical champion. According to Mark Jones, HIE's principal investigator, "One major reason networks fail is that they do not have a 'good first day' because their data is not rich and the network never really recovers from that." This upfront work takes time. The Oklahoma City data exchange, one of the early operational networks in SMRTNET, has just begun to see a rise in use. SMRTNET examined the network's data on clinical use—measured by the number of "clicks" into the system within a 2-week period—and found that use increased substantially from September 2009 to May 2010 (from 100 to 1,600 clicks).



The SMRTNET planning process is what drives the HIE expansion effort. This highly structured, rapid-cycle process develops consensus among all participating entities on governance, legal agreements, privacy, quality, return on investment, sustainability, and technology. Before joining SMRTNET, one network received a proposal from a national consulting group for planning an HIE that estimated the cost at \$290,000 and a planning period of 9 months. With SMRTNET, the network completed its planning in 2 months at a cost of \$30,000. Since the grant ended, seven networks in Oklahoma have used this process to plan their HIE, and hospitals from other States have inquired about adapting it for their own use. SMRTNET is currently working with eight hospital systems in Tampa Bay, Florida, to develop an HIE. The planning process, which was facilitated by SMRTNET staff, was completed in 4 days, with 50 hospital leaders and stakeholders participating in 8 meetings. The network in Florida will “function as the HIE backbone for western Florida” and will include at least 28 hospitals in 17 counties.

References

Agency for Healthcare Research and Quality. National Healthcare Disparities Report. Available at: <http://www.ahrq.gov/qual/nhdr07/nhdr07.pdf>, 2007.

Available at: U.S. Census Bureau. Estimates (2009). <http://www.census.gov/>. Accessed: September 2010.

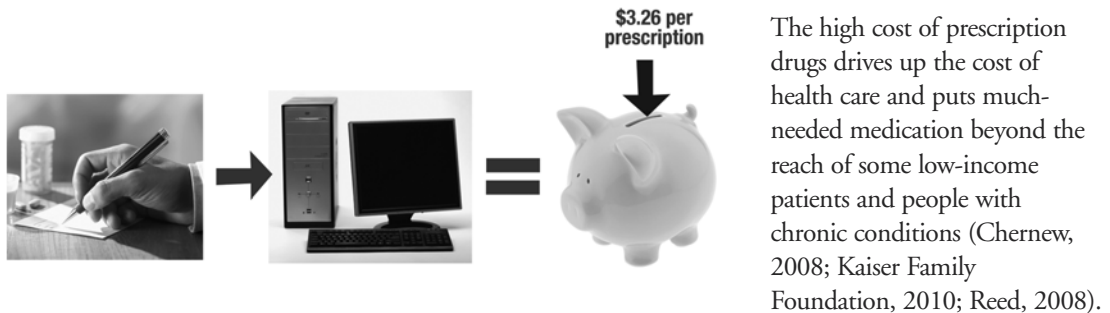
Oklahoma Health Care Authority. Oklahoma Health Care Insurance and Access Survey County-Level Chartbook. Available at: <http://www.okhca.org/research.aspx?id=88&parts=7447>, 2009.

The Commonwealth Fund, Aiming Higher: Results from a State Scorecard on Health System Performance. Available at: http://www.commonwealthfund.org/Statescorecard/Statescorecard_show.htm?doc_id=496090. Accessed April 13, 2010.





7 Electronic Prescribing: Lowering Patients' Prescription Drug Costs



Physicians may contribute to the problem by prescribing a higher cost drug simply because they are not aware that an equally effective alternative is less expensive.

In response to this issue and to increase patient safety, two health plans in Massachusetts helped physicians to implement an “electronic prescribing (e-prescribing) system” that enables physicians to electronically write and fax a prescription directly to a pharmacy.¹⁴ The system provides real-time information on the relative costs of drugs—or “formulary decision support”—as well as information on drug dosing and drug interactions. Using an ARHQ THQIT grant to evaluate the system, researchers at Massachusetts General Hospital and Brigham & Women’s Hospital found that formulary decision support can significantly increase the use of therapeutically equivalent lower cost medications by 3.3 percent and save approximately \$3.26 per prescription. Building on this study, the researchers are both investigating how to encourage more physicians to use the system and evaluating the effectiveness of additional system components.

Health IT Implementation to Address a Health Care Need

An e-prescribing system with formulary decision support was launched in 2003 by Tufts Health Plan, Blue Cross Blue Shield of Massachusetts, and Zix Corporation. Physicians connect to the system from a handheld device or computer with Internet access. Once logged into the system, physicians review a patient’s drug history and electronically fax new prescriptions or refills directly to the patient’s pharmacy. Physicians select drugs from a color-coded list indicating the drug’s relative cost. The names of medications with the lowest cost sharing appear in green, more expensive medications still covered by the health plans appear in blue, and medications not covered appear in red. All physicians who contract with the Tufts Health Plan or Blue Cross Blue Shield of Massachusetts were invited to participate in the system, and the insurers targeted their recruitment efforts to physicians who prescribe a high volume of medications.

¹⁴ Unless otherwise cited, the material in this case report comes from Joel Weissman’s final report to AHRQ, “E-prescribing Impact on Patient Safety, Use and Cost,” for Grant 5 R01 HS015175-02.



In addition to formulary decision support, the e-prescribing system notifies participating physicians of typical doses for common drugs and alerts them to potential drug interactions. The physicians also received a 1-year license to use the e-prescribing software at no cost, a free hand-held device to run the software, and 6 months of Internet or wireless service. The research team tracked the prescribing patterns of participating and nonparticipating physicians from 6 months before the e-prescribing system was in place through 12 months after it was implemented.

Grant Title: E-Prescribing Impact on Patient Safety, Use and Cost

Principal Investigator: Joel S. Weissman, Boston, Massachusetts

Contract Number: This project was supported by grant number R01 HS 015175 from 9/30/2004 to 12/31/2007.

AHRQ NRC Web Page: http://healthit.ahrq.gov/FRPT_Weissman_R01HS015175



Key Results

During the 18-month study period, 1,496 physicians had the system in place, and 81 percent of them wrote one or more e-prescriptions. Physicians prescribed lower cost drugs 3.3 percent more often when they used the system than when they wrote prescriptions by hand. The research team estimated that this change saved \$3.26 per prescription. According to the research team, the findings show that “doctors want to do the right thing, but they don’t always have the right information available.”

The study findings also suggest that an e-prescribing system may help to improve patient outcomes by, for example, preventing serious drug interactions. The researchers are further assessing this impact.

Tufts Health Plan and Blue Cross Blue Shield of Massachusetts have used the study results to expand the system to other physicians and an additional software vendor (Tufts Health Plan, 2010). The research team used the results as the basis for focus groups on the adoption and use of the system (Weingart, 2009). Physicians in the groups indicated that financial incentives had the most influence on their decision to adopt the e-prescribing system and that financial assistance was especially important for physicians practicing alone or in small groups. Physicians also reported that they continued to write some prescriptions by hand even when they had the e-prescribing system because transmitting a prescription to a pharmacy sometimes took hours, and some pharmacies lost the e-prescriptions. Addressing these issues could increase the extent to which the e-prescribing system is adopted and used, further lowering prescription drug costs.

References

Available at: Kaiser Family Foundation. Prescription Drug Costs: Background Brief. http://www.kaiseredu.org/topics_im.asp?id=352&imID=1&parentID=68. Accessed May 5, 2010.

Available at: Tufts Health Plan. Initiatives: e-prescribing. <http://www.tuftshealthplan.com/members/members.php?sec=pharmacy&content=initiatives>. Accessed May 5, 2010.

Chernew M, Gibson TB, Yu-Isenberg K, et al. Effects of increased patient cost sharing on socioeconomic disparities in health care. *J Gen Intern Med* 2008 Aug;23(8):1131-6.

Reed M, Brand R, Newhouse JP, et al. Coping with prescription drug cost sharing: knowledge, adherence, and financial burden. *Health Serv Res* 2008; 43(2):785-97.

Weingart SN, Massagli M, Cyrulik A, et al. Assessing the value of electronic prescribing in ambulatory care: a focus group study. *Int J Med Inf* 2009;78:571-8.





8

Integrated Telemedicine System Demonstrates Reduction in Children's Emergency Department Visits



Children in school and child care settings often exhibit symptoms of acute illness, with staff unable to decide which students need to be sent home. It is common for these children to be removed from the setting, even though they may not be contagious or pose a significant risk to other children. These unnecessary removals come at a great cost to both families and the health care system. Children lose learning time and parents must take time off from work, often until they get a doctors' note confirming that the child is well enough to return to school or child care. For parents in low-wage occupations in particular, this may lead to loss of income or even a job. Low-income parents also are more likely than more well-off parents to bring their children to costly emergency departments (EDs) rather than a physician's office for care (Halfon et al., 1996).

In 2001, pediatricians from the University of Rochester Medical Center developed and implemented a telemedicine initiative to help address this problem. The Health-e-Access program gives "child sites" (child care centers and schools) access to telemedicine equipment and trained telehealth assistants—either on-site or roaming—who can facilitate remote consultations with primary care physicians. Those consultations allow for timely diagnosis and treatment of children and reduce unnecessary removals of those who are not contagious or in need of immediate in-person medical care. The visits are typically with the childrens' own physicians, which promotes continuity of care.

A 2004 AHRQ THQIT[†] grant allowed the program to expand to additional sites and funded an evaluation of the program. Children enrolled in Health-e-Access received more medical care than a similar group of unenrolled children. Also, because they were less likely to use EDs (see Table 8.1), their access to care was much more convenient and was less disruptive to educational and parental workplace responsibilities; in addition, the cost of care to participating insurance companies was lower.

TABLE 8.1: HEALTH-E-ACCESS CHILDREN'S ACCESS AND COST RELATIVE TO OTHER SIMILAR CHILDREN

Outcome	Difference
Visits for Illness	
<i>Total</i> *	+22.9 percent
<i>Emergency Dept.</i>	-23.6 percent
Cost of all illness visits†	-3.0 percent

* Includes office, ED, urgent care, telemedicine

† Estimate assumes telemedicine visits are reimbursed at usual office visit rates and ED visits avoided are reimbursed at rates typical in the Rochester community for telemedicine-appropriate problems.



Health-e-Access has expanded to include 10 child care centers and 12 elementary schools. The program's demonstrated cost reductions led all local payers other than fee-for-service Medicaid¹⁸ to reimburse costs of telehealth visits. In the summer of 2010, in part as a result of a different AHRQ-sponsored grant,¹⁹ Health-e-Access will expand into elder care by introducing access to locations such as assisted living environments and senior day care centers.

Grant Title: Valuation of Primary Care-Integrated Telehealth

Principal Investigator: Kenneth M. McConnochie, Rochester, New York

Grant Number: This project was supported by grant number R01 HS 015165 from 9/30/2004 to 9/29/2008.

AHRQ NRC Web Page: http://healthit.ahrq.gov/FRPT_McConnochie_R01HS015165

¹⁸ According to Federal statute, such reimbursement would require a waiver, which can only be granted if applied statewide.

¹⁹ Principal Investigator, Dr. Manish Shah, R01 HS018047, Evaluating Telemedicine for Acute Illnesses in Assisted Living Residences



Health IT Implementation to Address a Health Care Need

Successful implementation of Health-e-Access required developing appropriate technology, obtaining funding, and engaging stakeholders. One early hurdle Health-e-Access pediatricians faced was developing a technology capable of allowing them to provide remote diagnoses. After a pilot in a primary care office showed the commercial equipment and software to be cumbersome and unreliable, they contracted with developers to create a customized telemedicine system collaboratively. Those efforts resulted in TeleAtrics™, a proprietary technology (AHRQ, 2009).²⁰ Following the development of TeleAtrics, the Health-e-Access program was launched in 2001 with funding from the U.S. Department of Commerce (Glaser, 2009), operating initially in three inner-city child care centers that received telehealth consultations from a single primary care practice.

The founders of the program recognized that for the program to be able to sustain itself, insurers would need to reimburse the costs of the telehealth consultations, something they would do only if Health-e-Access did not increase health care costs. To test the cost effectiveness of the program in a wider range of settings, AHRQ provided a THQIT grant for Health-e-Access to expand its services to 12 elementary schools and 3 more child care centers and to fund a program evaluation. The children in the participating sites were predominantly low-income and either African American or Hispanic. Several local payers, including commercial insurers offering Medicaid-managed care products agreed to participate and reimburse costs for the project's 3-year duration.

Health-e-Access recruited 10 physician practices to perform the consults, 5 in Rochester and 5 in its eastern suburbs. The number of practices was limited by their acceptability to participating insurance organizations and available funding for purchasing telemedicine equipment. Prior to the project, the participating practices provided primary care to roughly 70 percent of children in the participating child sites. Those practices also agreed to serve both uninsured children and those with coverage through other insurers.

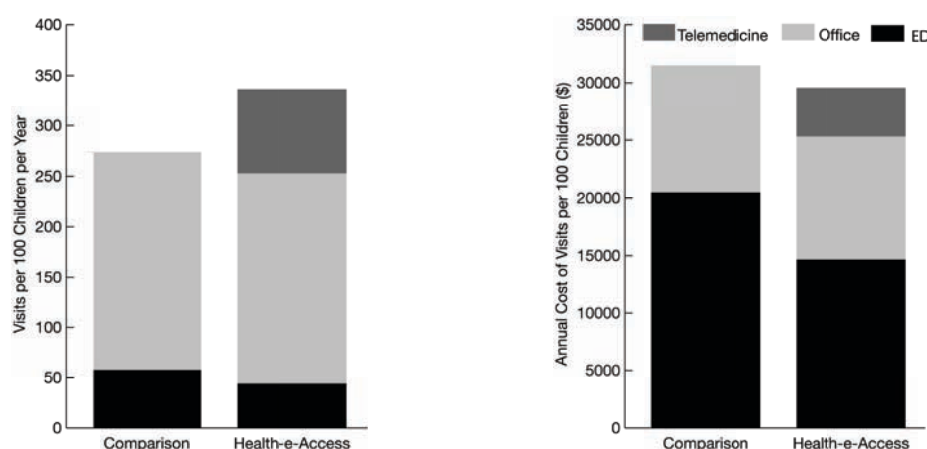
²⁰ As of April 2010, TeleAtrics™ is available commercially through Trifecta Technologies, an early investor in the technology that subsequently acquired the sole rights to the technology.



Key Results

The AHRQ-funded evaluation of Health-e-Access examined program impacts on the use of different types of health services. The researchers compared the number of in-person visits to primary care offices, telemedicine consultations, and visits to an ED for acute illness between children enrolled in the program and a group of children matched for age, gender, ZIP code, and insurer. Researchers found that Health-e-Access children had more total visits to health care providers than the comparison children because of the telemedicine consults. But they also had 24-percent fewer ED visits than the comparison children. Despite the higher number of overall visits among Health-e-Access children, the program was cost-effective because of the decrease in ED visits (see Figure 8.1), which cost roughly seven times more than a telemedicine visit (McConnochie et al., 2009).

FIGURE 8.1. NUMBER AND COST OF MEDICAL CARE VISITS, BY TYPE OF VISIT, FOR CHILDREN ENROLLED IN HEALTH-E-ACCESS VS. COMPARISON CHILDREN



The potential value of Health-e-Access to families, child sites, and clinicians is also clear. A prior analysis found that 91 percent of parents with telemedicine access through Health-e-Access reported that it had saved them a visit to their physician or an ED. The fact that it is attractive for families makes Health-e-Access valuable for child sites that want to recruit parents and ensure proper attendance by children. The availability of roaming telehealth assistants who can serve multiple sites increases feasibility for relatively small sites. Clinicians surveyed through the AHRQ-funded evaluation generally reported that the telemedicine system was easy to use. They reported that the software was simple to learn and visits required no more time than a typical office visit. In addition, 83 percent were as confident in the telemedicine diagnoses as in those completed in person (McConnochie et al., 2008).



References

Agency for Healthcare Research and Quality. Remote visits by pediatricians for sick children at inner-city and other child care centers/schools reduce absences and emergency department use. AHRQ Health Care Innovations Exchange, Nov. 2009. Accessed at: <http://www.innovations.ahrq.gov/content.aspx?id=2084> on April 22, 2010.

Glaser V. Innovative programs in telemedicine: the value of on-site healthcare delivery for inner-city children. *Telemed JE Health* 2009 Sep;15(7): 629-33.

Halfon N, Newacheck PW, Wood DL, et al. Routine emergency department use for sick care by children in the United States. *Pediatrics* 1996 Jul;98(1):28-34.

McConnochie, KM, Wood NE, Herendeen NE, et al. Acute illness care patterns change with use of telemedicine. *Pediatrics* 2009 Jun;123(6):e989-95.

McConnochie KM, Dick A, Herendeen N, et al. Variation of the Rochester-Area program of primary care-integrated telehealth. Final Report to the Agency for Healthcare Research and Quality, December 2008.





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